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ABSTRACT

A study examined the effect on reading achievement, mathematics achievement, and ACT scores when computer based instruction (CBI) was compressed into a 6-week period of time. In addition, the effects of learning style and receptive language deficits on these scores were studied. Computer based instruction is a primary source of instruction that does not require supplements or book-type follow-up, in contrast to computer assisted instruction which supplements instruction that has been planned and delivered primarily by a teacher. Subjects, 62 high school seniors attending urban schools in a large metropolitan city, were divided into experimental and control groups. Seven test instruments were first administered to all subjects. Students had all scored below the 50th percentile in either reading, mathematics, or language. Classes met 2 hours twice a week for 6 weeks, and were held in a computer laboratory containing a WICAT educational system. Results indicated that statistically significant gains were made in reading and mathematics when CBI was compressed into 6 weeks. Results showed no relationship between learning style and achievement. Moreover, students with receptive language deficits achieved as well as their non-language deficit peers using this non-oral method. The effectiveness of CBI instruction is directly contingent upon the depth, quality, and range of software and its capacity for matching instruction with ability levels and needs of students. (Eighteen references are attached.) (SR)

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A Computer Based Program to Improve Reading and Mathematics Scores for High School Students

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INTRODUCTION

This research was conducted to study the effect on reading achievement, mathematics achievement and ACT scores when computer based instruction (CBI) was compressed into a six week period of time. In addition, the effects of learning style and receptive language deficits on reading achievement, mathematics achievement, and gains in ACT scores were studied.

Most of the published studies involving the use of computers for instruction focus on computer assisted instruction (CAI). That is, the computer supplements and reinforces instruction that has been planned and delivered primarily by a teacher. Less has been written about computer based instruction (CBI), probably as a consequence of there being very few programs available for the this type of instruction. With CAI the computer is used as a supplement or to assist, an already established program. CBI is a primary source of instruction that does not require supplements or "book" type follow-up.

For those readers interested in a broad coverage of and background in computer instruction and reading, the works of Blanchard, Mason, and Daniel (1987) and Geoffrion and Geoffrion (1983) represent a synthesis of information. There is a growing body of data to support the effectiveness of computer instruction for a variety of adult and adolescent client groups (Balajthy, 1987; Kulik, Kulik, & Williams, 1983; Turner, 1988; and Young,

1988). However, most reviews and researchers alike warn against the use of reported achievement gains as the single basis for determining the effectiveness of instruction. In most cases, reviewers cite numerous flaws and research problems that render much of the reported data suspect.

This study was directed toward adolescent subjects instructed by the WICAT computer system in a controlled laboratory setting. It was the intent of this study to carefully control the conditions and type of software so that others could understand what was done and under what conditions specific achievement was made. Therefore, the major question to be answered was: "Can significant gains be made in reading achievement, mathematics achievement, and ACT scores when CBI is compressed into a six week period of time?" Additional questions studied included:

(1) Does learning style make a difference in reading achievement, mathematics achievement, and ACT scores when CBI is compressed into a six week period of time?

(2) Do the effects of a receptive language deficit make a difference in reading achievement, mathematics achievement, and ACT scores when CBI is compressed into a six week period of time?

METHOD

Instrumentation

Sixty-two seniors, with equal ratio of male/female and Black/White subjects, attending urban schools in a large metropolitan city were involved in this study. Pretest scores from the Test of Nonverbal Intelligence (Brown, Sherbenou, & Dollar, 1982), Nelson Denny (Brown, Nelson, & Denny 1976), Wide Range Achievement Test (Jastak & Jastak, 1965), along with scores from the ACT test which had been administered during the subjects' junior year, were analyzed with a *t*-test. It was found that there were no significant differences between the experimental and control groups in intelligence, reading and ACT scores. However, there was a statistically significant difference between the experimental and control groups in mathematics scores.

Instrumentation

On an alternating basis, seven instruments were administered to all subjects in the study. Tests included the following: (1) Test of Nonverbal Intelligence (Brown, Sherbenou & Dollar, 1982); (2) Detroit Tests of Learning Aptitude-2, Subtest III Oral Directions (Hammill, 1985); (3) Test of Adolescent Language-2, Subtest II Listening/Grammar (Hammill, Brown, Larsen & Wiederholt, 1987); (4) The Nelson Denny Reading Test (Brown, Nelson & Denny, 1976); (5) Individual Evaluation Procedures

in Reading, Form A (Rakes, Choate, Waller, 1983); (6) The Wide Achievement Test, Arithmetic, Level II (Jastak & Jastak, 1965); and, (7) Learning Style Inventory (Kolb, 1976).

Subjects participating in this research were selected based on their California Achievement test scores in reading, mathematics and language. Students scoring below the 50th percentile in one or more of the categories were identified as eligible for this study. Research was conducted during the summer between the students' junior and senior year.

Students participating in the study were pretested one week prior to the beginning of instruction. Tests were administered to measure intelligence, reading and mathematics levels, learning style and receptive language ability. At this time students were designated as experimental or control based on their work schedules which would allow or prohibit them from participating in the CBI program. The experimental group began classes the following week while the control group continued with their work schedules with no intervening instruction.

During the six weeks of instruction, classes met two hours twice a week. Instruction in both reading and mathematics was provided. Classes were held in a computer laboratory containing a WICAT educational system. The WICAT system has advantages over a microcomputer system in that several instructional packages can be run at any one time. Each curriculum package has a range of grade levels and can handle a range of ability levels. This

feature gives the advantage of flexibility that is often not available with other software programs used with microcomputers. Students work individually and at their own rate.

The week following the sixth week of instruction, both experimental and control groups were posttested. Only reading and mathematics achievement were tested at this time. Scores from the ACT test, which was administered during the subjects' senior year in high school, were used as posttest measures.

RESULTS

The data collected for this study were analyzed for the following major question: "Can significant gains be made in reading achievement, mathematics achievement, and ACT scores when CBI is compressed into a six week period of time?" Since there was no significant difference between the pretest means of the experimental and control groups for reading and ACT scores, the data were analyzed with *t*-tests. All data were tested at the .05 level of significance. Upon examination of the t-values, it was determined that there was a significant difference between posttest scores for reading and ACT.

Because of the significant difference between the pretest means of the experimental and control groups in mathematics, an analysis of covariance (ANOCOVA) was used. Prior to using the ANOCOVA, a test for homogeneity of regression was performed. The results of the test indicated parallel regression slopes (F =

.105, ns). Because a common slope could be assumed for all conditions, other steps in the analysis were conducted. Upon examination of the F ratio, it was determined that there was a significant difference in the adjusted means of the two groups.

To answer the question, "Does learning style make a difference in reading achievement, mathematics achievement, and ACT scores when CBI is compressed in a six week period of time?", analysis of covariance was used. The ANOCOVA was used to statistically control for the differences in the number of subjects in the experimental group who differed in learning styles. Prior to using the ANOCOVA, tests for homogeneity of regression were performed. The results of the test indicated parallel regression slopes (Reading, F = 2.40, ns; Mathematics F = 2.56, ns; ACT, F = 1.27, ns). Because a common slope could be assumed for all conditions, other steps in the analysis were conducted. Upon examination of the f-ratios, it was determined that there was no significant difference between learning styles and reading achievement, mathematics achievement, or ACT scores.

To answer the question, "Does a receptive language deficit make a difference in reading achievement, mathematics achievement, and ACT scores when CBI is compressed into a six week period of time?", *t*-tests were used to analyze the data. Upon examination of the t-values, it was determined there was no significant difference between the group with language deficits and the group without language deficits.

DISCUSSION

The purpose of this research was to study the effects of an intensive computer based program on reading and mathematics achievement scores. Scores from the ACT, given one year apart, were also studied. The results of the analyses of posttest performance between experimental and control groups indicated that statistically significant gains could be made in reading and mathematics when CBI was compressed into a six week period of time. Furthermore, those gains may have carried over as there was a statistically significant difference in post ACT scores between the experimental and control groups.

Computer based instruction often implies that the human teacher takes a less aggressive role in instruction itself and becomes more of a facilitator in diagnosing, selecting the levels of instruction, and monitoring student. The effectiveness of this type of teacher role in computer learning environments is certainly a relevant question. This research tends to support this change in teacher role. It also supports the use of instruction delivered via computers with the strong caution that it is directly contingent upon the depth, quality and range of software and its capacity for matching ability levels and needs of students. Presently, very little software and/or computers are available for this kind of instruction although the potential has begun to be developed and established as is evidence in this

study.

Learning styles, or those characteristic behaviors of learners that serve as indicators of how they perceive, interact with, and respond to the learning environment (Keefe, 1979), has provided some guiding principles for truly individualizing instruction. However, because CAI is a relatively new learning medium for most students it is possible that some differences in achievement may be reflected as a consequence of particular styles. With the increased use of computers in the classroom, it may be helpful that the learning styles of students be assessed before attempts are made to use computer based instruction for extensive remediation. In studies by Clariana and Smith (1988), learning style shifts after the introduction of CAI were documented and indicated that particularly when learners are separated into low and high ability groupings, the high ability groups changed more than the low ability groups. These findings suggested that if learning style preference does in fact change after moderate exposure to CAI, perhaps deeper level cognitive changes could and were occurring. Such changes may have long term effects greater than specific content learned through CAI. The purpose for including learning styles in this research was to investigate the premise that if a student's learning style is congruous to the context of learning offered through computer instruction, then the learning will be greater for that student.

The findings of this study indicated that there was no

relationship between learning style and achievement over a six week period of time. Thus, it would appear that in a short time frame and a particular clinical learning environment, learning styles were not impacting achievement and learners with different styles can benefit from computer based instruction.

Factors influencing reading achievement are varied. One important influence is language. Research in reading has demonstrated that a relationship exists between language acquisition, which includes both receptive and expressive language, and reading development. While many research studies have investigated the relationship between receptive and expressive language abilities with reading, much of that focus has been directed toward specific, morphological, semantic and syntactic abilities and reading achievement. There has been little research focusing on the global aspects of receptive language which is more applicable and generalizable for the classroom teacher. The research that has been done has demonstrated that receptive language deficits can affect learning in all areas of the curriculum (Bond & Shepperson, 1986; Wiig & Semel, 1986). As with learning styles, the premise that receptive language would affect the amount of gains with CBI in both reading and mathematics achievement, influenced the decision to include receptive language as a variable in this research.

Students with receptive language deficits are often not able to succeed in school, particulary when the major method of

instruction is conducted by lecture. If students possess receptive language deficits they either have difficulty following oral presentations or they have a complete lack of understanding information which is presented orally, thus resulting in failing grades. In addition, remedial instruction often is not successful when the major portion of the teaching is conducted through auditory methods. The results of this study indicated that when non oral, remedial methods, in the form of CBI, were used with the receptive language deficit students, they could achieve as well as their non language deficit peers.

The small sample size of this study limits the applicability to the general population. However, if this study is representative of a high school population, the implications indicate a need for intensive computer based summer programs to help raise reading and mathematics scores for high school students. The need for short term summer sessions for high school students is obvious when one considers the numbers of high school students who have low reading and mathematics scores but who also need to spend their summer vacations as part of the work force rather than in a full time summer remedial program.

The results of this study support the implication that there is a need for providing alternative methods of learning for all students, but particulary for those who have receptive language deficits. Given a chance to learn through non oral delivery of instruction, receptive language deficit students can indeed make

significant gains in reading and mathematics.

The use of the WICAT computer system made a difference in the reading and mathematics scores of those students participating in the study. While there was a statistically significant difference in the post ACT scores between the experimental and control groups, additional research is necessary in order to determine if gains made through a short term computer program are maintained. A follow up study of students who had participated in the summer program would be also be in order. Questions to be studied could include the graduation ratio between the experimental and control groups; the ratio of students going on for post high school education; and the success of the students in the work place.

Selected References

Balajthy, E. (1987). What does research on computer-based instruction have to say to the reading teacher? Reading Research and Instruction. 27, 54-65.

Bond, C.L. & Shepperson, G.M. (1985). The effects of language processing on school achievement. Paper presented at the twenty-ninth annual conference of the College Reading Associate, Pittsburg, PA.

Blanchard, J.S., Mason, G.E., Daniel, D. (1987). Computer applications in reading. 3rd edition. Newark, DL: International Reading Association.

Brown, J.I., Nelson, M.J., & Denny, E.C. (1976). The Nelson Denny Reading Test. Boston: Houghton Mifflin.

Brown, L., Sherbenou, R.J., & Dollar, S.J. (1982). Test of Nonverbal Intelligence. Austin, TX: pro-ed.

Clariana, R.B. & Smith, L.J. (1988). Learning style shifts in computer-assisted instructional settings. Paper presented at the annual meeting of the American Education Research Association, New Orleans, LA. (ERIC Document Reproduction Service Number ED 174 678).

Clariana, R.B. & Smith, L.J. (1988). Learning style shifts in computer-assisted instructional settings. Resources in Education. ED. 295 796.

Geoffrion, L.D. & Geoffrion, D.P. (1983). Computers and Reading

Instruction, Reading, MA: Addison-Wesley.

Hammill, D.D. (1985). Detroit Tests of Learning Aptitude-2, Subtest III Oral Directions. Austin, TX: pro-ed.

Hammill, D.D., Brown,V.L., Larsen, S.C., & Wiederholt, J.L. (1987). Test of Adolescent Language-2, Subtest II Listening/Grammar. Austin, TX: pro-ed.

Keefe, J.W. (1979). Learning style: An Overview. Student Learning Styles. Reston. VA: National Association of Secondary School Principals.

Kolb, D.A. (1976). Learning Style Inventory. Boston: McBer.

Kulik, C., Kulik, J.A., & Williams, G.W. (1983). The effectiveness of computer-based adult education: A meta-analysis of findings. Review of Educational Research. 50, 525-544.

Jastak, J.F. & Jastak, F.R. (1965). The Wide Achievement Test, Arithmetic, Level II, Wilmington: Guidance Associates of Delaware.

Rakes, T.A., Choate, J.S., & Waller, G.L. (1983). Individual Evaluation Procedures in Reading, Form A. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Turner, T.C. (1988). Using the computer for adult literacy instruction. Journal of Reading. 31, 643-647.

Wiig, E.H. & Semel, E.M. (1976). Language assessment and intervention. Columbus, Ohio: Charles E. Merrill.

Young, D. & Irwin, M. (1988). Integrating computers into adult literacy programs. Journal of Reading, 31, 648-652.